

(Assessment)

**【0076】** Coating films #1 through #10 were examined for the superficial hardness based on the wear resistance test set forth in paragraph 7.7 of standard No. JASO M 330, "Rigid Plastic Glazing Materials for Automobile," by the Japanese Automobile Standard Organizations. In paragraph (4), the procedure of the wear resistance test, subparagraph (4.6) prescribes "a sample shall be placed on a rotary table of a wear testing machine so that a surface of the sample to be exposed outside vehicle is worn by the wearing rollers of the wear testing machine. A load of 4.90 N (500 gf) shall be applied to the wearing rollers. Then, the sample shall be rotated to wear off by 100 revolutions." However, when assessing coating films #1 through #10, the samples were rotated by 200 revolutions. Note that the used Taber wear testing machine and haze meter were produced by SUGA TESTING MACHINE Co., Ltd. Table 2 below sets forth the results of the wear resistance test.

TABLE 2

	Comp. Ex. No. 1	Comp. Ex. No. 2	Ex. No. 1	Comp. Ex. No. 3	Ex. No. 2	Ex. No. 3	Comp. Ex. No. 4	Ex. No. 4	Comp. Ex. No. 5	Ex. No. 5
	Coat- ing film #1	Coat- ing film #2	Coat- ing film #3	Coat- ing film #4	Coat- ing film #5	Coat- ing film #6	Coat- ing film #7	Coat- ing film #8	Coat- ing film #9	Coat- ing film #10
Initial Haze $H_0$	0.3	0.2	0.2	0.3	0.2	0.1	0.3	0.3	0.5	0.4
Post-wear Haze $H_1$	20.2	10.6	5.0	17.0	4.1	5.2	22.3	5.2	26.6	9.6
$\Delta H (= H_1 - H_0)$	19.9	10.4	4.8	16.7	3.9	5.1	22.0	4.9	26.1	9.2

Note: The post-wear hazes  $H_1$  are the haze values after the samples were rotated on the Taber wear testing machine by 200 revolutions.

**【0077】** In Example Nos. 1, 2 and 3, coating films #3, #5 and #6 were prepared by curing paints #3, #5 and #6 in which titanium tetraisopropoxide (i.e., titanium alkoxide) was added to the synthesized methacrylic titanasilicate. In Comparative Example No. 1, coating film #1 was prepared by curing paint #1 in which no titanium tetraisopropoxide was added to the synthesized methacrylic titanasilicate. In Comparative Example Nos. 2 and 3, coating films #2 and #4 were prepared by curing paints #2 and #4 in which tetramethoxy silane or 3-methacryloxy propyl trimethoxy silane was added to the synthesized methacrylic titanasilicate instead of titanium tetraisopropoxide. Accordingly, as can be understood from Table 2, coating films #3, #5 and #6 according to Example Nos. 1, 2 and 3 exhibited a smaller haze-value increment  $\Delta H$  after the wear resistance test than coating films #1, #2 and #4 according to Comparative Example Nos. 1, 2 and 3 did. Thus, it was confirmed that coating films #3, #5 and #6 according to Example Nos. 1, 2 and 3 had a higher hardness than coating films #1, #2 and #4 according to Comparative Example Nos. 1, 2 and 3 did. Moreover, among coating films #1 through #6, coating film #5 according to Example No. 2 exhibited the least haze-value increment  $\Delta H$ . Note that coating film #5 was prepared by curing paint #5 in which not only titanium tetraisopropoxide but also tetramethoxy silane (i.e., an alkoxy silane compound) were added to the synthesized methacrylic titanasilicate.

**【0078】** Moreover, coating films #7, #8, #9 and #10 were examined for the superficial hardness. In coating films #7, #8, #9 and #10, note that the synthesized acrylic Al layer polymer or methacrylic Mg layer polymer was used as the layer organic-inorganic composite

instead of the synthesized methacrylic titanosilicate, and that titanium tetraisopropoxide and tetramethoxy silane were added or they were not added. Specifically, in Example Nos. 4 and 5, coating films #8 and #10 were prepared by curing paints #8 and #10 in which titanium tetraisopropoxide and tetramethoxy silane were added to the synthesized acrylic Al layer polymer or methacrylic Mg layer polymer. In Comparative Example Nos. 4 and 5, coating films #7 and #9 were prepared by curing paints #7 and #9 in which titanium tetraisopropoxide and tetramethoxy silane were not added to the synthesized acrylic Al layer polymer or methacrylic Mg layer polymer. Accordingly, as can be understood from Table 2, coating films #8 and #10 according to Example Nos. 4 and 5 exhibited a smaller haze-value increment  $\Delta H$  after the wear resistance test than coating films #7 and #9 according to Comparative Example Nos. 4 and 5 did. Thus, it was confirmed that coating films #8 and #10 according to Example Nos. 4 and 5 had a higher hardness than coating films #7 and #9 according to Comparative Example Nos. 4 and 5 did.

**[0079]** Moreover, it was not observed that the particle components precipitated from the solvents even when 3 months and 6 months passed after the synthesized methacrylic titanosilicate and methacrylic Mg layer polymer were processed into the respective paint compositions. In addition, it was confirmed possible to form flat coating films by using not only the 3-month-old paint compositions but also the 6-month-old paint compositions.

**[0080]** Having now fully described the present invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the present invention as set forth herein

including the appended claims.